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For: ENDOVASCULAR TISSUE REMOVAL DEVICE

- 1 1. An endovascular tissue removal device comprising:
2 a lumen including a rotatable terminal hub advanceable in vasculature;
3 at least one fiber extending from the hub for ablating tissue; and
4 an expandable mechanism connected to the fiber for biasing it into
5 position for precisely ablating tissue as the hub rotates.

- 1 2. The device of claim 1 in which there are a plurality of fibers extending
2 from the hub and connected to the expandable mechanism so that the plurality of fibers
3 can be spread apart for tissue ablation and also collapsed together for vascular insertion
4 and removal.

- 1 3. The device of claim 1 in which the expandable mechanism is a
2 circumferentially expanding balloon.

- 1 4. The device of claim 3 in which there are two balloons, one inside and one
2 outside of the distal end of the fiber.

- 1 5. The device of claim 3 in which the lumen includes an inflation conduit
2 therein connected to the balloon.

1 6. The device of claim 1 in which the fiber is an optical fiber connected to a
2 source of laser energy.

1 7. The device of claim 1 in which the fiber is a waveguide connected to a
2 source of laser energy.

1 8. The device of claim 1 further including a tissue trap device surrounding
2 the expandable mechanism.

1 9. The device of claim 1 in which the fiber includes an angled distal portion.

1 10. The device of claim 1 further including a mirror for redirecting the
2 ablation energy.

1 11. The device of claim 1 further including an expandable mechanism
2 inflatable on the ventricular side of the valve for supporting the leaflets of the valve.

1 12. The device of claim 11 further including an absorptive surface on the
2 expandable mechanism for absorbing ablation energy.

1 13. The device of claim 11 in which the expandable mechanism is a balloon.

- 1 14. An endovascular tissue removal device comprising:
2 a hub advanceable in vasculature;
3 a plurality of fibers extending from the hub for ablating tissue; and
4 an expandable mechanism connected to the plurality of fibers for
5 spreading the fibers into position for resection and for collapsing the fibers together for
6 vascular insertion and removal.

- 1 15. An endovascular tissue removal device comprising:
2 a hub advanceable in vasculature;
3 a plurality of fibers extending from the hub for ablating tissue; and
4 an expandable balloon connected to the plurality of fibers for spreading the
5 fibers into position for resection and for collapsing the fibers together for vascular
6 insertion and removal.

1 16. An endovascular tissue removal device comprising:
2 a fiber advanceable within vasculature to ablate tissue;
3 an outer expandable balloon; and
4 an inner expandable balloon spaced from the outer expandable balloon
5 forming a space within which the fiber travels to resect tissue.

1 17. The endovascular tissue removal device of claim 16 in which the outer
2 expandable balloon is a portion of a tissue trap device.

1 18. The endovascular tissue removal device of claim 16 in which the distal
2 end of the fiber is angled.

1 19. The endovascular tissue removal device of claim 16 further including an
2 expandable mechanism inflatable on the ventricular side of the valve for supporting the
3 leaflets of the valve.

1 20. The endovascular tissue removal device of claim 19 further including an
2 absorptive surface on the expandable mechanism for absorbing ablation energy.

1 21. The endovascular tissue removal device of claim 19 in which the
2 expandable mechanism is a balloon.

1 22. A method of removing the aortic valve, the method comprising:
2 introducing a lumen within the vasculature of a patient to a situs proximate
3 a heart valve to be resected;
4 introducing ablative energy into the lumen; and
5 rotating the lumen to resect the heart valve.

1 23. An endovascular valve removal device comprising:
2 a lumen including a rotatable terminal hub advanceable in vasculature;
3 at least one fiber extending from the hub for ablating valve tissue;
4 a first expandable mechanism connected to the fiber for biasing it into
5 position for precisely ablating valve tissue as the hub rotates; and
6 a second expandable mechanism inflatable on the ventricular side of the
7 valve for supporting the valve leaflets during resection.